Natural disasters and economic growth in Africa

Kwame Adjei-Mantey and Frank Adusah-Poku

Graduate School of Economics, Kobe University

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Kwame Adjei-Mantey[*1], Frank Adusah-Poku [*]

Abstract

The continent of Africa has experienced its fair share of natural disasters historically and in contemporary times. The effect of natural disasters on economic growth has generated useful but inconclusive debates in the literature. Different studies have found positive, negative or no significant effects at all in some cases of disasters on growth. This makes the question of what impacts natural disasters have on an economy's growth a purely empirical one and more meaningful to be examined on a case by case basis. Using panel data solely for the continent of Africa from 1980-2015, our regression results show a significant negative effect of natural disasters on economic growth, growth in agricultural value-added and growth in industrial value-added. Additionally, our results also show that disaster effect appears and persists in the post-year periods. The negative relationship between economic growth and disasters is also robust to different disaster measures. We recommend the need to invest in the modernization of the agricultural sector in Africa with the goal of withstanding the negative effects of natural disasters.

Keywords: Africa, economic growth, disaster measures, natural disasters, climate change.

[1]Corresponding Author
[*]Graduate School of Economics, Kobe University, Japan.

kwamemantey@gmail.com (Adjei-Mantey) fadusah-poku@yahoo.com (Adusah-Poku)

1. Introduction

The occurrence of a natural disaster in any part of the world is troubling. Individual countries, regional bodies and other groups have become more concerned about the experiences of natural disasters irrespective of where they occur and have gotten more involved in helping deal with the ramifications of these disasters on the disaster locations. This is proof of the importance the global economy attaches to natural disasters. Though the occurrence of natural disasters dates back to history, contemporary times have experienced their own share of disasters. Recent experiences of natural disasters around the world include the 2011 earthquake that hit northeast Japan of magnitude 9.0. Confirmed number of deaths according to the country's reconstruction agency stood at nearly 15,900 persons as of 2016 with many other persons unaccounted for. The 2010 earthquakes in Haiti and Chile, the 2004 tsunami in the Indian ocean as well as the devastating hurricane Katrina in 2005 are other examples of disaster happenings in recent times. These natural disasters together with many others usually lead to the loss of human lives and property causing economic and social damages to countries that suffer such disasters. Data from the Emergency Events Database (EM-DAT) for instance suggest that flood disasters alone in the past two decades have resulted in economic losses of an estimated $662 billion globally.

In Africa, there have been experiences of natural disasters as well. In August 2017, three days of heavy rainfall led to flooding and mudslide in Sierra Leone in which over one thousand died and many were unaccounted for. The 2011 drought that hit the East African countries of Kenya, Eritrea, Ethiopia, Somalia and Djibouti has been described as the worst drought to have been experienced in those countries in over 60 years. A volcanic eruption in Eritrea in 2011 and severe flooding suffered in Southern Africa in 2011 are just a few examples of many natural disasters that Africa has recorded in its recent history.

While natural disasters in general have been a major cause for concern, conclusions about its economic implications on disaster locations have been far from definite. The inconclusiveness of findings about the economic implications of natural disasters is confirmed by Klomp (2016) who posits that while about 25% of studies on this subject matter report a negative effect of disasters on per capita real GDP figures, 15% report the opposite. Evidence from the literature show that natural disasters can impact economic growth through such variables as capital accumulation (Leiter et al., 2009); trade (Gassebner et al., 2010; Oh and Reuveny, 2010) and employment (Umezawa, 2014). While some studies report that natural disasters positively affect economic growth (Albala-Bertrand, 1993; Skidmore and Toya, 2002; Ahlerup, 2013), others report that natural disasters affect economic growth negatively (MacDermott et al., 2014; Klomp, 2016) and others find no effect at all (Guo et al., 2015). The diversion in these findings can be well grounded in the theory of growth. On one hand, because natural disasters usually lead to loss of human lives and property, inputs into production including physical and human capital are reduced thereby reducing the capacity for productivity and production and hence subsequently, an expected fall in economic growth results. On the other hand, attempts to rebuild an economy that has suffered from a natural disaster may lead to better structures and systems as well as enhanced technologies being introduced which have the tendency to improve productivity and subsequently increase economic growth. Since both schools of thought are valid, it leaves the conclusion of the impact of disasters on a particular economy or region a purely empirical one.

It is in this light that our study attempts to empirically measure what the effect of natural disasters that have occurred in Africa have been on the economic situation of Africa.

This paper makes a relevant contribution to the literature by providing evidence of what the effects of natural disasters have been on African economies. Previous studies have either

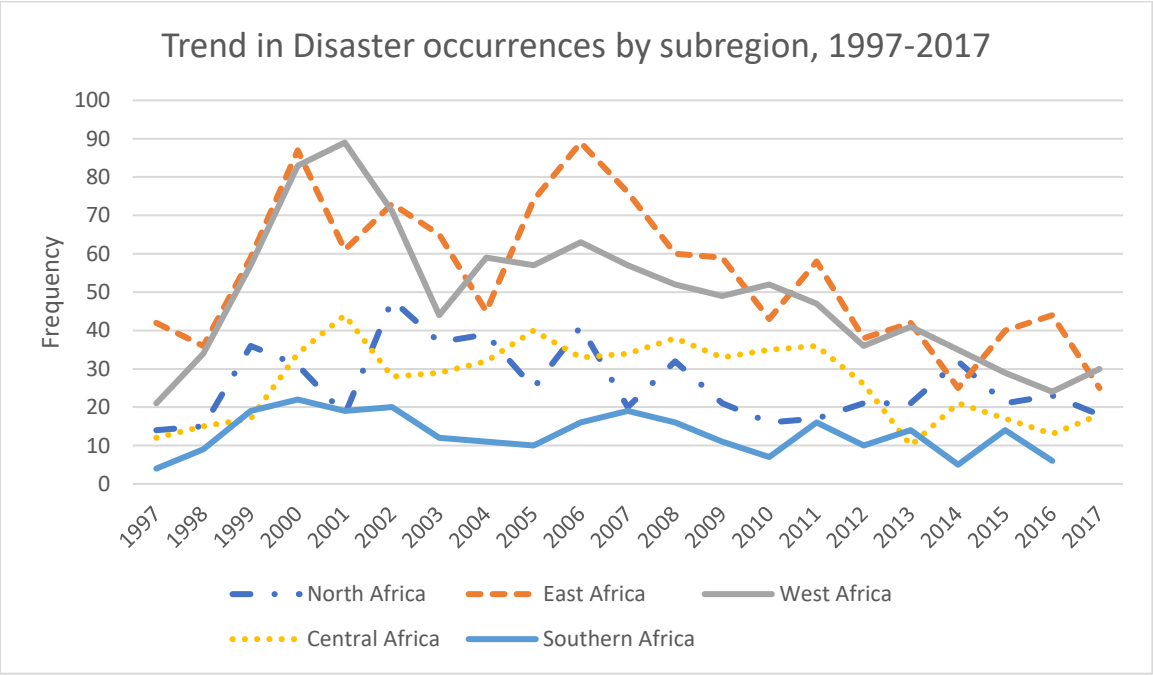
looked at particular disaster events (Shabnam, 2014 [floods]; Cavallo et al., 2013 [earthquakes, floods and windstorms]; Strobl, 2012 [hurricanes] etc.) or studied together many countries across different parts of the globe with different characteristics. Loayza et al. (2012) have observed that economic growth in developing economies are more sensitive to disaster shocks with significant magnitudes of impacts. The assertions above make a study such as this for the African continent alone which is composed of mostly developing economies relevant to the literature. Indeed, current data from the International Monetary Fund (IMF) reveals that the region of Africa has an average GDP per capita at current prices of US$ 1,990 with most of these countries in the region being developing countries. It is estimated that more than 90% of disasters occur in low income countries (Klomp, 2016) and they are worse affected by these natural disasters in terms of economic losses in that a bigger share of their GDP is affected as opposed to developed countries; whose economic losses though may be huge in absolute terms, may form a relatively smaller share of their total output. Another important contribution of this study is in the different ways we examine the variable natural disaster. Among other measures, we also look at the intensity of the disaster.

Further, considering the increasing significant role of cross-country trade and economic relationships in Africa, and the unique similarities that African economies tend to exhibit, a study that attempts to examine the impacts of disasters particularly on the continent as a unit gives useful insights into how the economy of the continent is affected and subsequently, provides evidence to support policies that will benefit all African economies mutually.

1.1 Trends in disaster occurrences in Africa over the past two decades by subregion

Figure 1 shows the trend in the occurrences of disasters in Africa by subregion in the past two decades.

Figure 1: Disaster trends in Africa by subregion, 1997-2017



Source: Authors' compilation with data from EMDAT, 2018

From the figure, it can be observed that on average, the Southern Africa region recorded the least number of occurrences of disasters over the period followed by countries in the North African region. Save the years 2000, 2004, 2010 and 2014 the East African region appears to have recorded the greatest number of disasters over the period. It is worthy to note, however, that the East African region has the largest number of countries in its composition while the Southern Africa region has the least number of countries in its composition. This could perhaps be responsible for the differences in the total occurrences in the subregions. That notwithstanding, the figure reveals that the entire continent of Africa has had its fair share of disaster occurrences. These disasters include droughts, flooding, fire disasters, bacterial and viral disease spreads, tsunamis, explosions, cyclones among others.

The rest of the paper is organized as follows. Section 2 reviews literature in this area of study; section 3 details the methodology of the empirical analysis; section 4 discusses the results from the study and section 5 concludes this paper.

2. Literature Review

Skidmore and Toya (2002) examined the relationship among disasters, capital accumulation, total factor productivity and economic growth in a multi country study. They noted that climatic events had a positive relationship with economic growth while geological events had a negative relationship correlation with growth. Overall, they found a positive relationship between natural disasters and growth. They argued that although disaster risk reduces return to physical capital, it increases return to human capital. They further argue that subsequent to disaster happenings, capital stock is updated and newer technologies are adopted leading to an overall positive effect on total factor productivity and economic growth. Guo et al. (2015) conducted a study to examine the impact of recorded disasters in 30 provinces of China on economic growth subsequently. While meteorological class of disasters were found to promote growth through human capital, there was no overall significant impact of disaster on economic growth.

Both studies of Skidmore and Toya (2002) and Guo et al. (2015) suggest that through human capital, natural disasters can have a positive impact on economic growth. The former study, further emphasizes total factor productivity as a channel through which increased economic growth can result from natural disasters. The latter study, however, finds that overall, there is no significant effect of disasters on growth. This is in agreement with the study of Cavallo et al. (2013) discussed in the following.

Cavallo et al. (2013) used data on 196 countries to examine the impact of what they termed "catastrophic" natural disasters on economic growth. They found that when they controlled for political changes, even extremely large disasters did not have any significant effect on economic growth. In the absence of such controls, they found that only extremely large events had negative effect on growth.

In a cross-country study by MacDermott et al. (2014), they show that natural disasters negatively affect economic growth especially in low income countries. This is because these poor countries usually have low financial sector development which makes it difficult to get the significant investment required to replace physical capital and infrastructure lost to extreme disaster events. In the case of rich countries, however, they argue that there may be a temporary fall in output as a result of the disaster but access to credit and increase in investment will return such economies to their long run growth path unlike the case for poor countries. Shabnam (2014) find that the number of people affected in flood disasters have a negative effect on economic growth while death rates have no significant effect on growth. The study found that

for every 0.1% of the population affected by floods, there is a decrease in GDP per capita of 0.005% and this was attributed to the fact that floods most obvious effect is the destruction of the livelihoods of persons affected. Klomp (2016) examined the effects of natural disasters on economic development using night time light intensity as a measure of economic development. He found a negative relationship between these variables. He further found that climatic and hydrological disasters are more significant determinants of development in developing countries while for advanced economies, the more significant determinants were disasters in the geophysical and meteorological class. He found the degree of financial development in a country as well as the quality of political institutions as relevant in partly explaining the impact of disasters.

MacDermott et al. (2014) highlight the level of financial sector development as an important determining factor in the effect that disasters would have on an economy's growth. This points out that when examining the effects of disasters on economies, it is important to study economies with similar characteristics together rather than lump up economies with different economic characteristics together in a single study. The study of Klomp (2016) interestingly examines the impact of disasters on economic development rather on economic growth only and thus uses night light intensity rather than GDP figures alone. As interesting as this is, it is important to note that not all economies especially economies with weaker institutions would necessarily translate increases in output into tangibles such as increased physical luminosity. Again, for many developing countries, even when institutions are not weak, development needs are multiple and it only takes policy discretion to decide how to channel proceeds from increases in growth. That said, it is important to examine, separately from such infrastructure as night light intensity, what natural disaster effects are on the economy's growth.

Strobl (2012) examined the growth impacts of hurricanes on developing economies in the Central American and Caribbean regions. The paper argues against investigating disaster impacts without paying specific attention to the region within which disasters occur due to the fact that different geographical regions suffer from different probabilities of experiencing a disaster for which reason it focuses solely on the geographical region it used for its study. After controlling for country specific economic conditions and timing of the disaster occurrence, the author finds that on average a hurricane strike resulted in loss in output growth by 0.84 percentage points in the study area. Felbermayr and Groschl (2014) also show in their study of over 100 countries that natural disasters unequivocally have negative effects on growth. They find that a disaster in the top 1 percentile disaster index causes a reduction in per capita GDP by almost 7% at the minimum the top 5 percentile index leads to a reduction of 0.46% in per capita GDP. They argue, though that factors such as stronger institutions, greater trade openness and financial openness help to reduce the negative effects of disasters on growth by speeding up the economic recovery process.

Following the review of the literature, we find sufficient motivation for our decision to study the case of African economies on their own as a unit in our study given the similarities they have with regards to economic indicators. Further, we find from the literature that a case by case examination of these variables is relevant for policy making and thus motivates us to examine the case for the African region.

3. Empirical Analysis

3.1 Empirical Specification

We estimate the following empirical specification:

$$Y_{it} = \alpha + \sum_{j=0}^{1} Disaster_{it-j} + X_{it} + \gamma_i + \varepsilon_{it} \quad (1)$$

where Y_{it} is the log GDP per capita, growths in agricultural, industrial and services value added in country i at time period t, and $Disaster_{it-j}$ denotes either an occurrence of a disaster, disaster intensity, the number of deaths resulted or the number of people affected. Log GDP per capita is used as a proxy for economic growth. We make use of all the different types of disasters including droughts and floods. Control variables such as trade openness, quality of institutions, population and capital investment are captured by X_{it}, and country-specific effects are captured by γ_i controlling for unobserved heterogeneity across countries. We allow up to a one-year lag because of the possibility for the effects of disasters to persist for more than the current period of the disaster.

3.2. Data Description

Most studies on the growth effects of natural disasters (Loayza et al. 2012; Felbermayr and Groschl, 2014; Dell et al. 2012) have utilized the Emergency Events Database (EM-DAT) provided by the Center for Research on the Epidemiology of Disasters (CRED). This study also makes use of this data for our disaster variables. The EM-DAT is compiled from various sources including UN agencies, non-governmental organizations, national governments, insurance companies, research institutes and press agencies. There are more than 22,000 disasters in the EM-DAT ranging from natural to technological disasters. For an event to be termed as a disaster in the EM-DAT, it should meet one of the following criteria: 10 or more people were reportedly killed, 100 or more were reportedly affected, a state of emergency was declared, or international assistance was called for.

We also include some control variables used in related papers of Loayza et.al (2012) and Felbermayr and Groschl (2014). These authors make use of a set of structural and domestic policy variables. Structural factors include variables such as total population (variable of the size of the economy), polity index (an index of democratization) and trade openness (defined as imports plus exports divided by GDP). Capital investment (defined as gross capital formation) is used as a proxy for domestic policy in a country. Data on control variables such as population, trade openness and investment capital are drawn from the World Development Indicators. Data on quality of institutions are taken from the Polity IV project. The study uses an unbalanced panel data covering 50 sub-Saharan African countries. Data covers the period, 1980-2015.

We define our first disaster variable as *disaster occurrence* which is a dummy variable denoting the occurrence or non-occurrence of a disaster. It takes the value of one if a disaster has occurred at least once during a year in a country. Table 1 shows that on average, the occurrence of a disaster in Africa is 0.65 per year. Although the variable, *disaster occurrence* is able to capture the frequency of a disaster event in a given country in a year, it is not able to address issues with regards to the severity of the disaster. To overcome this limitation, we introduce the variables, *death toll* and *people affected.* The variable, *death toll* is defined as the number of deaths and missing people. The number of the injured, affected and left homeless as a result of the occurrence of the disaster is denoted by the variable, *people affected.* On average, about

250,000 people are affected by a disaster in Africa with about 449 people losing their lives or found missing. We also construct a variable called *disaster intensity* to measure the intensity of a disaster. This variable is defined as the ratio of the number of people affected and left homeless (*people affected)* to the population of a country.

Table 1: Summary Statistics

Variable	Obs.	Unit	Mean	S D	Min.	Max.
GDP per capita	1732	USD	1833.26	2535.25	115.44	20172.31
Growth Industrial sector	1416	%	4.25	10.87	-73.65	127.44
Growth Services sector	1420	%	4.46	7.20	-57.12	66.12
Growth Agric. sector	1423	%	3.26	10.65	-44.62	73.58
Population	1796	1000 people	15400	22400	220.605	182000
Polity index	1771	Index	-1.18	5.95	-10	10
Trade openness	1705	share	0.73	0.49	0	5.32
Capital Investment	1514	Million USD	4160	1050	-20.6	97400
Disaster occurrence	1800	dummy	0.65	0.48	0	1
Death toll	1800	people	449.0	8254.84	0	300000
People affected	1800	1000 people	250.373	1164.063	0	23300
Disaster intensity	1796	ratio	0.022	0.088	0	1.051

4. Empirical Results

We begin the analysis by analyzing the effect of disaster occurrence on log GDP per capita, growths in agricultural, industrial and services value added. The results of this analysis are available in Table 2. Standard errors are clustered at the country level throughout the analysis to control for intra-country error correction. We include a one year lag in disaster variables to investigate whether disaster effect appears and persists in the post-year periods. We first estimate models without the controls as shown in columns 1, 3, 5 and 7. Results from the first two columns in Table 2 show that disaster occurrence and its first lag is strongly negative, indicating that the occurrence of a disaster is negatively related to the economic growth in African countries. Disaster is found to have an immediate negative effect on growth. Specifically, an occurrence of a disaster reduces growth by 0.70 percentage points in the first year, holding all other variables constant. The one-year lag variable is also negatively and statistically correlated with economic growth implying that the effects of a disaster persist for more than one year. This implies that ignoring the lagged effects of disaster on growth will lead to an underestimation of the full effects which extends beyond the first year. Another observation is that the effect of disaster on growth in the first year is larger than the effect in the second year of the disaster. This suggests that immediate and proactive responses are taken to reduce the long-term impacts of disasters on growth in most African countries. In column 2, we include key control variables such as total population, polity index, trade openness and capital investment. Most of these control variables had their expected signs, though they are

not statistically significant with the exception of capital investment. The negative correlation between disasters and growth still holds with the inclusion of the full battery of control variables. Although the effect is still negative and statistically significant, the magnitude of the effect reduces.

We also find a negative relationship between an occurrence of a disaster and the growth in agricultural value-added. Specifically, an occurrence of a disaster reduces growth in agricultural value-added by 1.48 percentage points in the first year with a 0.36 percentage points decline in the second year. The coefficients of disaster occurrence and its first lag are still negative and statistically significant even after we have controlled for other factors as shown in column 4. Our results are consistent with the results of Dell et.al (2012) who found a negative impact of temperature on industrial valued-added. The agricultural sector is a key backbone of economies of many African countries. Industrial production is also often dependent on inputs from the agricultural sector. One of the channels through which disasters affect agricultural growth rates is its effects on access to raw materials and intermediate inputs. Disasters such as floods, drought and bacteria disease decrease access to agricultural raw materials like seedlings and unharvested plants or fruits, thereby leading to a decline in the growth of the agricultural sector. Another possible channel is the effect of disaster on total factor productivity. Disasters like storm, floods and landslide could destroy agricultural infrastructure such as dams and irrigation canals which could slow down the growth of the sector via the productivity of these infrastructure. Extreme weather events such as floods and drought could lower agricultural yields resulting in a reduction in the growth of agricultural value-added.

The results in Table 2 also show, substantial negative effects of disasters on growth in industrial-value added. Column 5 shows that an occurrence of a disaster is associated with a 0.909 percentage points lower growth in industrial output in the first year and a 0.513 percentage points in the second year. The point estimates of disaster are still statistically significant even after including the control variables as shown in column 6. Africa's industrial sector is underdeveloped and only a few countries like South Africa, Egypt, Morocco and Tunisia have significant industry. As a result, the industrial sector is not able to strongly withstand the negative impacts of disasters on industrial value-added, likely due to lack of preparations. A key observation from the results in Table 2 is that, the point estimates of disaster is substantially larger in the case of the agricultural sector than the industrial sector. This suggests that the agricultural sector is more affected by disaster compared to the industrial sector. This is not so surprising as a large share of disasters in Africa are dominated by droughts which directly affect agricultural activities as compared to industrial activities. We do not find evidence that disasters affect growth in service value-added as shown in columns 7 and 8.

Table 2: The effect of disasters on different growths, measured by disaster occurrence.

Variables	(1) GDP per capita	(2) GDP per capita	(3) Agric. Growth	(4) Agric. Growth	(5) Industrial Growth	(6) Industrial Growth	(7) Service Growth	(8) Service Growth
Disaster occurrence	-0.007***	-0.005***	-1.476*	-1.030**	-0.909**	-1.017**	0.141	0.089
	(0.002)	(0.002)	(0.098)	(0.029)	(0.108)	(0.080)	(0.557)	(0.584)
L. Disaster occurrence	-0.006***	-0.004***	-0.355**	-0.130***	-0.513***	-0.267***	1.080	1.304
	(0.002)	(0.002)	(0.007)	(0.002)	(0.076)	(0.056)	(1.518)	(1.556)
Polity index		-0.017		0.021		0.156		0.169**
		(0.007)		(0.060)		(0.124)		(0.071)
Population (log)		0.036		0.625		11.843**		1.688
		(0.057)		(3.108)		(4.645)		(3.413)
Trade openness		-0.013		1.860		11.231***		2.529*
		(0.048)		(1.321)		(3.849)		(1.473)
Capital Investment		0.011*		0.680		1.928**		0.721
		(0.004)		(0.414)		(0.744)		(0.434)
Observations	1731	1458	1422	1216	1415	1216	1419	1213
Adjusted R^2	0.161	0.345	0.022	0.013	0.055	0.058	0.033	0.045

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. robust standard errors are clustered by country and reported in parentheses.

Note: Agric. Growth, Industrial Growth and Service Growth are annual % growth in Agricultural value added, Industrial value added and Services value added.

In Tables 3, 4 and 5, we conduct similar analysis using alternative measures of disaster variables. These alternative measures of disaster variables are representative of the severity and intensity of disasters. These measures depict the extent of the effect of disasters on growth in terms of disaster intensity, human losses and people affected. We apply the same estimation strategy used in Table 2. When the disaster variable is measured as disaster intensity, the results as shown in table 3 show similar results as in table 2. Across all specifications, disaster is found to be negatively related to growth. Specifically, natural disaster is associated with a 0.9-1.4 percentage points decline in growth in the first year. The results also show some persistence in terms of the effects of the disaster after the first year. Specifically, the coefficients of the one-year lagged variable indicate that growth decline resulting from disaster intensity ranges from 0.8-1.2 percentage points. We also find evidence of a negative relationship between disaster and agricultural and industry value-added as shown in columns 3, 4, 5 and 6. However, we do

not find a statistical relationship in the case of service value-added confirming our earlier results in table 2.

Table 3: The effect of disasters on different growths, measured by disaster intensity

Variables	(1) GDP per capita	(2) GDP per capita	(3) Agric. Growth	(4) Agric. Growth	(5) Industrial Growth	(6) Industrial Growth	(7) Service Growth	(8) Service Growth
Disaster intensity	-0.014**	-0.009**	-7.540**	-9.006**	-2.754*	-3.110**	1.262	1.486
	(0.054)	(0.002)	(1.424)	(1.973)	(0.865)	(0.102)	(1.557)	(1.689)
L. Disaster intensity	-0.012**	-0.008**	-1.929*	-0.596**	-0.365*	-1.359**	1.182	1.151
	(0.053)	(0.017)	(0.079)	(0.055)	(0.030)	(0.095)	(3.585)	(3.768)
Polity index		-0.054		0.023		0.161		0.163**
		(0.017)		(0.063)		(0.125)		(0.072)
Population (log)		0.081		0.081		11.078**		2.464
		(0.596)		(3.036)		(4.522)		(3.219)
Trade openness		0.122		2.117		11.401***		2.410
		(0.090)		(1.340)		(3.847)		(1.478)
Capital Investment		0.118*		0.667		1.932**		0.716
		(0.010)		(0.415)		(0.757)		(0.427)
Observations	1731	1458	1422	1216	1415	1216	1419	1213
Adjusted R^2	0.151	0.338	0.022	0.017	0.045	0.058	0.030	0.040

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. robust standard errors are clustered by country and reported in parentheses.

Note: Agric. Growth, Industrial Growth and Service Growth are annual % growth in Agricultural value added, Industrial value added and Services value added.

We also find evidence that disasters reduce growth, agricultural value-added and industrial value-added when the disaster variable is measured by the death toll as shown in table 4. However, we do not find evidence that disasters reduce growth, agricultural value-added and industrial value-added when disaster is measured by the number of people affected. Although the coefficients are negative, they are not statistically significant. The results from tables 3,4 and 5 suggest that the growth effects of disasters are largely robust to different disaster measures with the exception of only the number of people affected.

Table 4: The effect of disasters on different growths, measured by death toll

Variables	(1) GDP per capita	(2) GDP per capita	(3) Agric. Growth	(4) Agric. Growth	(5) Industrial Growth	(6) Industrial Growth	(7) Service Growth	(8) Service Growth
Death toll	-0.0013**	-0.0019*	-0.201**	-0.396**	-0.111**	-0.351**	-0.004	-0.318
	(0.002)	(0.002)	(0.001)	(0.099)	(0.001)	(0.150)	(0.002)	(0.299)
L. Death toll	-0.008**	-0.0041*	-0.409*	-0.828***	-0.228***	-0.500***	0.111	0.083
	(0.001)	(0.002)	(0.093)	(0.282)	(0.080)	(0.041)	(0.178)	(0.136)
Polity index		0.004		0.044		0.286		0.098**
		(0.005)		(0.163)		(0.202)		(0.001)
Population (log)		0.230**		-2.763		14.847		1.493**
		(0.066)		(7.177)		(9.005)		(0.740)
Trade openness		0.009		1.629		12.770		1.369
		(0.094)		(2.434)		(9.769)		(2.180)
Capital Investment		0.013		0.684		2.638**		0.346
		(0.019)		(0.475)		(1.300)		(0.610)
Observations	1731	1458	1422	1216	1415	1216	1419	1213
Adjusted R^2	0.421	0.496	0.041	0.058	0.078	0.056	0.033	0.059

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. robust standard errors are clustered by country and reported in parentheses.

Note: Agric. Growth, Industrial Growth and Service Growth are annual % growth in Agricultural value added, Industrial value added and Services value added.

Table 5: The effect of disasters on different growths, measured by people affected

Variables	(1) GDP per capita	(2) GDP per capita	(3) Agric. Growth	(4) Agric. Growth	(5) Industrial Growth	(6) Industrial Growth	(7) Service Growth	(8) Service Growth
People affected	-0.001	-0.003	-0.036	-0.029	-0.012	-0.063	-0.014	0.022
	(0.006)	(0.006)	(0.137)	(0.167)	(0.088)	(0.110)	(0.080)	(0.077)
L. People affected	-0.002	-0.001	-0.127	0.214	-0.050	-0.008	-0.015	-0.017
	(0.005)	(0.004)	(0.142)	(0.158)	(0.090)	(0.088)	(0.052)	(0.066)
Polity index		0.003		-0.022		0.069		0.148
		(0.005)		(0.155)		(0.211)		(0.154)
Population (log)		0.189***		9.721		15.254***		13.294*
		(0.042)		(8.656)		(1.240)		(7.523)
Trade openness		-0.058		3.045		9.509		0.066
		(0.104)		(4.062)		(4.848)		(2.710)
Capital Investment		0.013		0.837**		2.491***		0.176**
		(0.020)		(0.393)		(1.332)		(0.004)
Observations	1731	1458	1422	1216	1415	1216	1419	1213
Adjusted R^2	0.377	0.472	0.104	0.090	0.045	0.083	0.109	0.114

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. robust standard errors are clustered by country and reported in parentheses.

Note: Agric. Growth, Industrial Growth and Service Growth are annual % growth in Agricultural value added, Industrial value added and Services value added.

5. Conclusion

Over the past decades, researchers have attempted to better understand the effects of disasters on economic growth. This has been the case because of the steady increase in the occurrence of disasters over these past decades. The goal of these studies is aimed at establishing the real growth effects of disasters to help in informing policy makers of the advantages of disaster risk reduction and mitigation. The new interests in this area has led to inconclusive results regarding the effects of disasters on growth. This paper therefore provides new evidence on the effects of natural disasters on growth in the case of Africa. The novelty of this study is the use of different measures of disaster to better understand the effects of disasters on different types of growths in Africa. These measures which capture occurrence and severity are employed to examine the extent to which disasters affect economic growth, growth in agricultural value-added, growth in industrial value-added and services value-added.

The regression results show a significant negative effect of natural disasters on economic growth, growth in agricultural value-added and growth in industrial value-added. However, we do not find evidence of a statistically significant negative relationship between disasters and growth in services value-added. We also find that the growth effects of disasters are largely robust to different disaster measures such as disaster intensity and death toll. Our results also show that disaster effect appears and persists in the post-year periods.

Although our results suggested that immediate and proactive responses have been taken to reduce the long-term impacts of disasters on growth in most African countries judging from the magnitudes of the coefficients of the one-year lag disaster variables, we recommend a more robust approach to mitigating the effects of disasters especially in the agricultural sector. Agriculture is the biggest economic sector in Africa employing more than 60 percent of the workforce. Hence, any major disaster shock without an immediate policy response in the sector will have major impacts on not only the agricultural sector but the entire economies of African countries. Going forward, there would be need to modernize the agricultural sector with the goal of withstanding the effects of natural disasters on growth in agricultural value-added and economic growth on the whole.

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